

Calibration and Performance of a 3D Imaging Calorimeter of DAMPE for Cosmic Ray Physics on Orbit

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The space experiment of DArk Matter Particle Explorer (DAMPE) developed in China is designed to find the evidence of dark matter particle by observing primary cosmic rays and gamma rays in energy range from 5 GeV to 10 TeV. Since its launch in December 2015, a large quantity of data has been recorded.

The BGO Electromagnetic Calorimeter (BGO ECAL) of the DAMPE is a total absorption calorimeter consisted of 308 BGO crystal bars that allows for a precise three-dimensional imaging of the shower shape. It provides a good energy resolution ($<1\%$ @200 GeV) and high electron/hadron discrimination ($>10^5$). The ECAL also provides a trigger capability for DAMPE. With the data set acquired during the first and a half years of operation in space, a precise time-dependent calibration for energy, shower topologies measured by the BGO calorimeter had been developed.

In this report, the instrumentation and development of the BGO ECAL is briefly described. The calibration on orbit, including the pedestal, minimum ionizing particle (MIP) peak, dynode ratio, and etc. is discussed, and more details about calibration methods and the performance in space are presented.

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